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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/553,573

10/17/2005

Christian Dussarrat

Serie 6070

1576

40582

7590

09/28/2010

American Air Liquide, Inc.
Intellectual Property Dept.
2700 Post Oak Boulevard
Suite 1800
Houston, TX 77056

EXAMINER

BURKHART, ELIZABETH A

ART UNIT

PAPER NUMBER

1715

MAIL DATE

DELIVERY MODE

09/28/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/553,573	Applicant(s) DUSSARRAT ET AL.	
	Examiner Elizabeth Burkhart	Art Unit 1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18,20,24-27,29 and 32-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18,20,24-27,29 and 32-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/22/2009 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 18, 24-27, and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973) in view of Mitzel (*Simple silylhydrazines as models for Si-N B-Donor Interactions in SiNN Units*).

Sato teaches a method of producing a silicon nitride film by CVD comprising: feeding a hydrazine gas (e.g. 1,1-dimethylhydrazine) and a silicon-containing precursor gas into a reaction chamber wherein a substrate is located within said reaction chamber and forming a silicon nitride film on said substrate by reacting said hydrazine gas with said silicon-containing precursor gas [0030]-[0037]. Sato discloses that any silicon compound may be used that is suitable for CVD [0031] and that silylhydrazines may be

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formed in a preliminary reaction chamber and then fed to the reaction chamber [0062].

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use silylhydrazines as the silicon-containing precursor in the process of Sato since it would have been a suitable precursor for silicon nitride deposition as is apparent in [0068] and Ex. 1 and Sato discloses that the type of silicon compound is not critical and any compound suitable for CVD may be used.

Sato does not disclose using disilylmethylhydrazine.

Mitzel discloses that a simple silylhydrazine, such as disilylmethylhydrazine, may be prepared by reacting a silicon-containing gas with a hydrazine gas (Abstract; p. 697, Conclusion).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use disilylmethylhydrazine as the silylhydrazine in the process of Sato since it is one of the simplest, most basic known examples of silylhydrazines as suggested by Mitzel and it has a similar structure to the silylhydrazine of Sato (e.g. $\text{SiH}_3\text{HNNHCH}_3$) such that it would have reasonably been expected to be a successful precursor for silicon nitride films.

Regarding Claims 24, 25, 32, and 33, Sato discloses the temperature during the CVD process is 500°C-800°C and the pressure is 0.1-760 torr [0036].

Regarding Claims 26 and 34, Sato discloses that an inert gas may be fed to the reaction chamber as a carrier gas (Ex. 1).

Regarding Claim 27, Sato discloses that the silicon-containing precursor gas may be fed into the reaction chamber and decomposed to form the silicon nitride film [0073]-

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[0081] and that silylhydrazine may be formed in a preliminary chamber and then fed to the reaction chamber [0068].

Thus, claims 18, 24-27, and 32-34 would have been obvious within the meaning of 35 USC 103 over the teachings of Sato and Mitzel.

3. Claims 20 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973) in view of Mitzel (*Simple silylhydrazines as models for Si-N B-Donor Interactions in SiNN Units*), as applied above and further in view of Fessenden et al (*An extension of and the reversibility of the silylamine-amine exchange reaction*).

Sato discloses that the silylhydrazine may be formed by the reaction of disilane and monomethylhydrazine [0068]. Sato and Mitzel do not disclose that the silylhydrazine may be formed by reacting silylamine gas with a hydrazine gas, such as trisilylamine with 1,1-dimethylhydrazine.

Fessenden teaches a silylamine gas may be reacted with a hydrazine to form a silylhydrazine, wherein a trimethylsilylhydrazine compound was formed by the reaction of hexamethyldisilazane and a phenylhydrazine (p. 4638-4639).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to form the silylhydrazine of Sato or Mitzel using a silylamine gas and hydrazine as suggested by Fessenden since the silylamine gas would have been a suitable alternative for disilane in producing a silylhydrazine. It would have been obvious to one of ordinary skill in the art to use other combinations of silylamines and hydrazines, other than those exemplified in Fessenden, to form a desired silylhydrazine.

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Thus, claims 20 and 29 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Sato, Mitzel, and Fessenden.

4. Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US 2001/0048973) as applied above in view of Ishikawa (JP 06338497).

Sato teaches a method of producing a silicon nitride film by CVD comprising: feeding a hydrazine gas (e.g. 1,1-dimethylhydrazine) and a silicon-containing precursor gas into a reaction chamber wherein a substrate is located within said reaction chamber and forming a silicon nitride film on said substrate by reacting said hydrazine gas with said silicon-containing precursor gas [0030]-[0037].

Sato does not disclose that the silicon-containing precursor gas may be trisilylamine.

Ishikawa teaches a CVD method of depositing silicon nitride wherein trisilylamine is reacted with ammonia (Abstract).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use trisilylamine gas as suggested by Ishikawa as the silicon-containing precursor gas in the process of Sato since Sato discloses that any silicon-containing gas suitable for CVD may be used and trisilylamine would have been suitable for CVD as evidenced by Ishikawa.

Thus, claims 18 and 24-26 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Sato and Ishikawa.

Response to Arguments

5. Applicant arguments directed to the new limitations in the claims have been addressed in the rejections above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Burkhart whose telephone number is (571)272-6647. The examiner can normally be reached on M-Th 7-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elizabeth Burkhart/
Examiner, Art Unit 1715

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/Timothy H Meeks/

Supervisory Patent Examiner, Art Unit 1715